

Fabrication and electron transport study of InAs/AlGaSb mesoscopic devices

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Abstract

This report will review our recent progress in the fabrication and electron transport studies of InAs/AlGaSb mesoscopic devices. InAs quantum wires, open quantum dot structures and single electron transistors have been fabricated by using AFM oxidation processes as well as e-beam and conventional fabrication processes.

Magnetoconductance fluctuations have been clearly observed at 4.2 K at low magnetic fields below 1 T, which were not seen in the conventional Hall-bar devices. The amplitude of the fluctuations was quite large even at 4.2 K in comparison with the case of GaAs system. The phase breaking time in InAs mesoscopic structures was estimated for the first time from the analyses of correlation functions of the magnetoresistance data. By employing the AFM process to oxidize InAs or GaSb as an insulator in an in-plane-gate structure, single electron transistors were fabricated. The device characteristics measured at 4.2 K showing Coulomb oscillations and Coulomb diamond are also reported.